

Optional Course**LS 503— RADIATION BIOLOGY [2 credits]**

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S No	Topic	Faculty	Contact Hours
1.	Interaction of radiation with matter: Different types of radiation. Ionization and excitation. Linear energy transfer, Direct and indirect effects of radiation Radiation chemistry of water	ABT	4
2.	Biological effects of radiations: Whole body irradiation and sensitivity of tissue Units of radiation measurement Radiation levels and limits	ABT	4
3.	Cell Survival curves: reproductive integrity mechanism of cell killing, survival curves in mammalian cells	ABT	2
4.	Radiosensitivity and cell cycle: Variation of sensitivity with cell age, effect of X rays and high let radiations, possible implications in radiotherapy	ABT	4
5.	Heritable effects of radiations: Chromosomal and chromatid aberrations, point mutations Mendelian, chromosomal and multifactorial diseases, genetic risk assessment, doubling dose, mutation component	ABT	4
6.	Modification of radiation induced damage Radio-sensitizers, Radio protectors, Normal tissue radioprotection Mechanisms of action, sulfhydryl compounds, WR series, dose reduction factor (DRF)	ABT, RPS	4
7.	Non targeted effects of radiations: Bystanders effects, chromosomal instability, adaptive response	ABT	4
8.	Mechanisms for the repair of DNA. Repair of DNA breaks. Repair of base damage: photoreactivation, excision repair, post-replication recovery. Base excision repair, nucleotide excision repair (NER), transcription coupled repair (TCR) and bulk DNA repair	ABT,RPS	4
9.	Radiation induced signaling pathways: Radiation-induced gene expression Signaling abnormalities in cancer Effects of signaling abnormalities on radiation responses	RPS	4
10	Radiation carcinogenesis: Initiation, promotion, progression Dose response for radiationinduced cancers Importance of age at exposure and time since exposure, Second tumors in radiation therapy patients	RPS	2

11	Radiotherapy of cancer: Background and latest advances, Mechanisms of radiation resistance in cancer treatment, Secondary tumor formation in radiation therapy, Radiation in combination therapy	RPS	2
12	Model systems in radiation biology: In vitro and in vivo assays, Xenograft of human tumors, Spleen colony assay, Spheroids, Spheroids of human tumor cells	RPS,ABT	2

Suggested reading:

1. Prasad, K.N., CRC Handbook of Radiobiology, CRC Press, Florida
2. Eric J Hall, Amato J Giaccia Radiobiology for the Radiologist Lippincott : Williams & Wilkins (Sixth Edition)
3. A.H.W. Nias An Introduction to Radiobiology John Wiley and sons